

Contents

Guidelines For Managing WOOD DUCK NEST BOXES In Washington State



prepared for

Washington Department of Fish and Wildlife

600 Capitol Way North
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by

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The Washington Waterfowl Association offers assistance to individuals seeking information for placing new nest boxes or who wish to volunteer to help with maintenance of existing nest boxes.

Contact WWA at their E-mail address:
www.waduck.org

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LAY OUT & EDITING BY:

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1. ABOUT THE WOOD DUCK

Description

Wood ducks are among the most beautiful ducks in North America. The males appear black and white from a distance. But up close, their iridescent green to purplish and white head, rust colored breast, bronze, black, and white sides, bright red eye, and multi-colored bill are very striking. The females are brown-gray, but have iridescent wing feathers, speckled breasts, and a prominent white eye-ring that tapers toward the back of the head like an exclamation mark. Both sexes have a crest of feathers that trails down the back of the head, and their feet are a dull straw-yellow color. The female's loud, squealing wee-e-e-e-k, wee-e-e-e-k call is distinctive to this duck and is often the first indication that wood ducks are in the area.



Wood ducks are about half the size of mallards and almost identical in size to hooded mergansers. Wood ducks average about 1.5 pounds in weight and are about 21 inches long (from tip of bill to end of tail), and have a 28.5 inch wingspread. In proportion to its wing length, wood ducks have the broadest wings of wild ducks. Wood ducks also have the largest eyes of any waterfowl, and longer tails than any waterfowl (except pintails). Short, broad wings, long tails, and large eyes are believed to help wood ducks fly through the maze of trees and branches that make up their habitat.

Wood Duck Distribution

As its name implies, wood ducks are "a duck of the woods". They nest in trees, roost in trees, and feed largely on fruits and seeds of woodland plants. Wood ducks are North American ducks. They do not occur naturally on other continents.

In North America, wood ducks are distributed in eastern and western populations. These populations are separated by the Great Plains and deserts of western North America. Wood duck distribution is similar to the distribution of the pileated woodpecker, which creates cavities almost perfect in size for wood duck nesting.

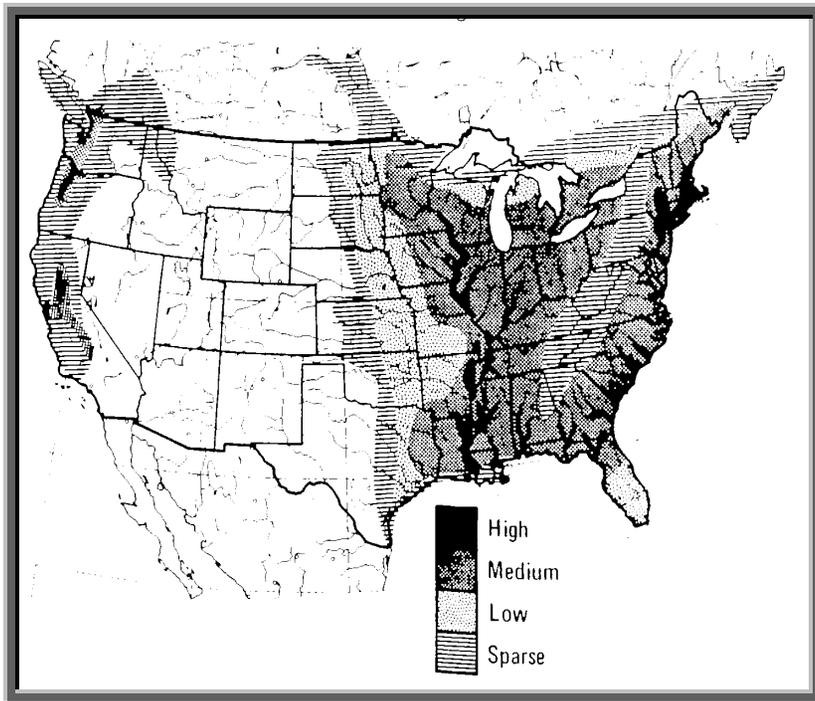


FIGURE 1: Wood duck nesting distribution in North America (reproduced with permission of Frank C. Bellrose from Bellrose, 1976).

Wood Duck Distribution (continued)

In Washington State, wood ducks occur on both sides of the Cascade Mountains but are much more abundant in western Washington than in eastern Washington. They are found throughout the forested lowlands of all counties west of the Cascade Mountains and are absent only in the higher elevations of the Olympic Mountains and the Cascades Mountains. The heavily forested lowland habitat and abundance of rivers, ponds, and wetlands in western Washington makes that portion of the state ideal for wood ducks. Bellrose and Holm (1994) reported that the highest densities of wood duck nesting in western Washington are near Olympia and the Vancouver to Longview segment of the Columbia River.

In eastern Washington, wood duck numbers and distribution are limited by a scarcity of large trees that contain suitable nest cavities near water. However, wood ducks are locally common in eastern Washington, along waterways with large cottonwood groves. They are most abundant along the Yakima, Wenatchee, Okanogan, Walla Walla, Pend Oreille, and Little Spokane rivers. Wood ducks are relatively abundant along portions of the Columbia River near Richland, Wenatchee, and Brewster. The forested lowlands in many areas of northeastern Washington are also used by nesting wood ducks. Riparian habitat development along some impoundments and nest box programs resulted in the expansion of wood duck nesting in eastern Washington into areas where they previously had few nesting opportunities.

Wood Duck Distribution (continued)

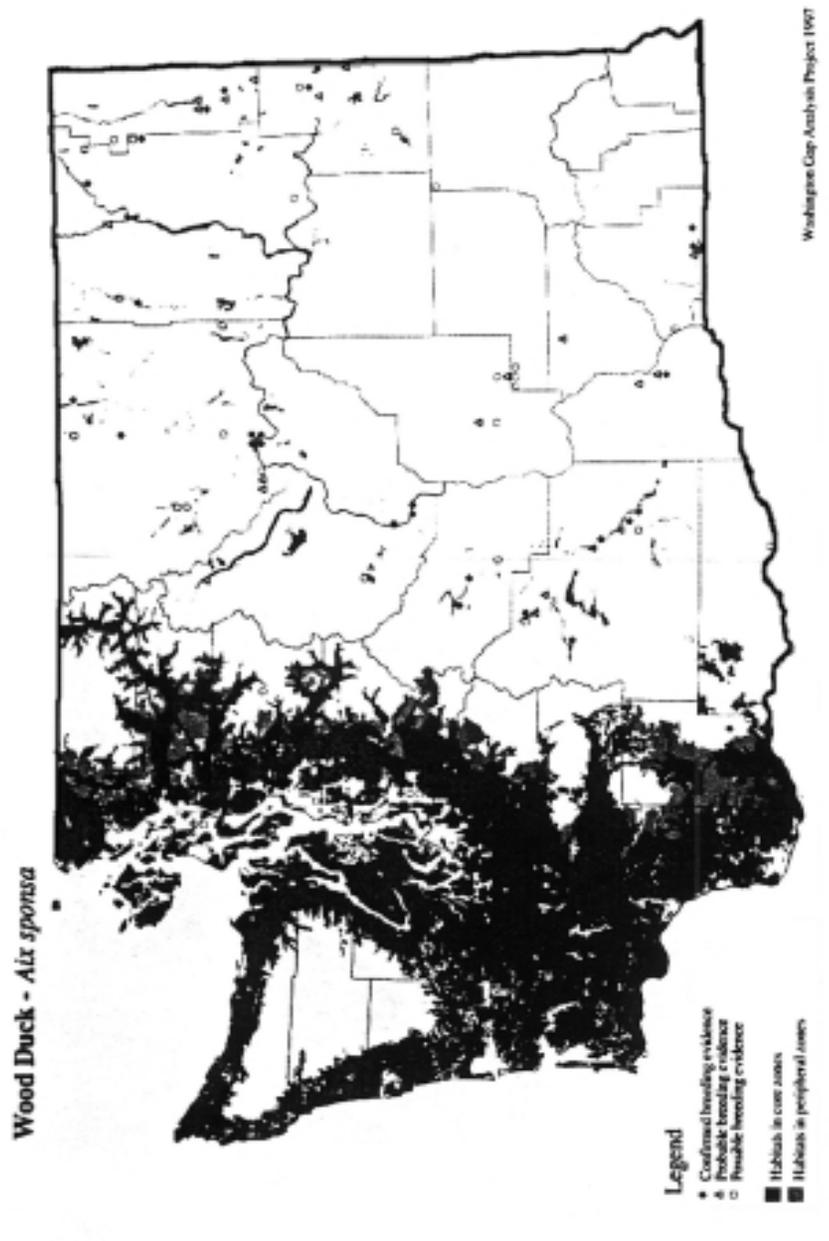


FIGURE 2: Wood duck nesting distribution in Washington (reproduced by permission of Seattle Audubon Society from Smith et al. 1997)

Migration To And From Washington:

Most of the wood ducks that nest in Washington migrate south prior to winter. We know from banded ducks harvested and reported by hunters, that many wood ducks from Washington state winter in the Sacramento Valley north of San Francisco, California. Some wood ducks winter in Washington and Oregon, primarily west of the Cascade Mountains. Wood ducks that nest west of the Cascades tend to migrate south along the west side of the Cascades. Wood ducks that nest east of the Cascades have been recovered both east and west of the Cascades during their migrations. Wood ducks migrate south early in the fall and return to Washington nesting areas in March or early April.



FIGURE 3: Wood duck migration to and from Washington State, (based on bird band returns reported to U.S. Fish & Wildlife Service through 1998).

Nesting Cavities

As their name implies, wood ducks are closely associated with habitats containing wooded areas near water. Ideally, the trees in those wooded areas should be big enough to have developed cavities of suitable size for wood ducks to nest in. Wood ducks are one of several duck species that nest in tree cavities. Bufflehead, hooded merganser, and common goldeneye are other cavity nesting ducks in Washington.

In nature, wood ducks select nest cavities in a variety of trees. Deciduous trees are good cavity producers and are more commonly used than are coniferous trees. In Washington, cottonwood trees provide many natural nest sites. Cottonwoods are relatively fast growing large trees and they are prone toward decay and cavity formation. They also thrive near water where wood ducks are likely to seek nest sites.

Entrance size of the nest cavity is important to female wood ducks seeking nest sites. Cavities with small entrances (3 inches by 4 inches are ideal) are used more by wood ducks than cavities with large entrances. Scarcity or availability of suitable nesting cavities can limit wood duck nesting even if most other habitat features are present. Competition for cavities from other animals (raccoons, opossums, other waterfowl, owls, kestrels, and especially starlings) may reduce the number of cavities available for wood duck nesting.

When natural nesting cavities are lacking, man made nest boxes can substitute for the lack of cavities. Nest boxes were first erected for wood ducks in Illinois in the late 1930's. Since then, many designs and modifications to nest boxes have taught biologists what works best for wood ducks.

Habitat Preferences

Habitat features influence wood duck nesting. Wood duck hens need suitable nesting cavities. The nest cavities should be within ½ mile of water. Activities of the adults occur near water, so they tend to seek and find nest cavities close to water. Slow moving or standing shallow waters with irregular shorelines containing coves and backwaters near forested habitat provide optimal habitat for wood ducks. Ponds, small lakes, old river channels, rivers, creeks, marshes, and swamps near standing trees usually offer good wood duck nesting and brood rearing habitat.



Waters with much woody debris (logs, stumps, standing trees, or trees felled into the water, such as beaver ponds) are sought by wood ducks. The adults, especially the males, use the woody debris for loafing during the day. Vegetation near and overhanging into the water provides brooding habitat (cover for protection from predators and inclement weather as well as food) for the ducklings when they hatch. Slow moving, shallow waters with much woody debris and shoreline vegetation also contain many invertebrates that are an important protein source in the hen's and duckling's diets.

Food Needs

Wood ducks are able to feed on a wide variety of both plants and animals (mostly invertebrates). They forage in aquatic habitats and on dry land away from water. Feeding activity for adults is highest in early morning and late afternoon. When feeding in water, wood ducks tend to feed on items on or near the water surface and seldom dive.

Ducklings feed at all times of the day, but most heavily during early morning, evening, and at nighttime. Ducklings can jump more than 6 inches from the water to catch invertebrates above them.

Duckweed, grass seeds, weed seeds, maple seeds, cultivated grains, nuts, and berries such as mulberry and blackberry are common plant foods in wood duck diets in Washington. Acorns are also a favorite food in the eastern United States.

Invertebrates (mostly beetles, flies, and spiders) are important protein sources for hens during the nesting season and for ducklings. Hens need so much protein when laying eggs that the lack of an adequate protein source can be a limiting factor to wood duck nesting. The amount of protein a hen needs to produce a clutch of eggs is equivalent to a hen ingesting one invertebrate every 5.5 seconds for 8 hours per day during the egg laying period.

Nesting Biology

Nest Site Selection: Male and female wood ducks form pair bonds on their wintering areas. Many of these ducks that nest in Washington spend the winter in California. They also winter in western Oregon and Washington and a few local areas east of the Cascades in southern Washington. In early spring, the males follow the females from the wintering areas to nesting areas. Females tend to return to nest in areas from which they fledged or successfully nested previously. Older hens are more faithful to nesting areas than younger hens and will often return to the same or nearby nest cavity or nest box annually.

Wood duck pairs arrive in nesting areas selected by the hens and begin searching for nest cavities in March and early April. The hen inspects potential cavities and selects a nest site. Wood ducks do not carry nesting material into nest cavities to build a nest. They lay their eggs and cover them with materials already in the bottom of the cavity. These materials are usually rotted wood and saw dust inside natural cavities or wood shavings and chips placed in nest boxes.

Egg Laying And Incubation: Wood ducks produce more ducklings than other ducks to offset high duckling mortality rates. In Washington, most wood duck eggs are laid in April and May. The hen lays one egg each day until her clutch is complete. During the early stage, the eggs are covered over with nesting material after each egg is laid. This gives a "mounded" appearance to the nesting material. When about half the clutch is laid, the hen begins to pluck feathers and down from her breast and adds these to the nest. When all the eggs have been laid and incubation begins, a thick mat of down and feathers surround the eggs, helping to protect and insulate them.

Nesting Biology (continued)

Incubating wood duck hens usually feed in the morning and evening. When the hen leaves the nest to feed (usually twice daily), she rearranges the blanket of down to completely cover and insulate the eggs.

Individual wood duck hens in Washington lay from 6 to 12 eggs per nest with 10 to 11 eggs being the average. The eggs are pale brown to tannish white and are generally 2 inches by 1-1/2 inches in size. The incubation period for most wood duck eggs ranges from 28 days to 32 days.

Variances in incubation periods result from differences in the amount of heat applied to the eggs. This is influenced by ambient temperature, attentiveness of the female during incubation, and the number of eggs being incubated (more eggs receive less heat).



ABOVE: A Wood Duck hen incubating her eggs inside a nest box.

Nesting Biology (continued)

Generally, most of the eggs in a clutch of wood duck eggs hatch on the same day. This happens because the hen covers the eggs with nest material each day as she lays each new egg and does not begin incubating them until all the eggs are laid. Egg development does not start until incubation begins. After they hatch, the hen broods (covers and warms) the newly hatched ducklings for the day and night following hatching. The day after the ducklings hatch, the hen is ready to lead the ducklings from the cavity. She usually checks for danger from the cavity entrance, flies to the ground or water below the nest, and calls to the young. They climb to the cavity entrance hole and jump from the hole to join the hen. Tiny toenails on their webbed feet enable them to climb up out of the box. A roughened interior to the nest cavity or box (or a wire mesh ladder fastened inside and below the hole) aids the ducklings in their climb to the exit hole. The hen then leads the brood of ducklings to nearby areas that provide food and cover.

Sometimes ducklings may be found left behind in nest boxes. These ducklings usually hatched later than the majority of the brood (because they were likely from eggs deposited by another hen after incubation had started). They remained in the box because the other ducklings had already left the box and the hen was not present to call these late ducklings from the box.

Wood ducks will renest if their nests are destroyed prior to hatching. Renesting attempts generally have smaller clutch sizes than earlier attempts. Hens will sometimes lay, incubate, and hatch two clutches of eggs in one nesting season. This “double brooding” occurs in Washington, but is more common further south where there are longer nesting seasons.

Nesting Biology (continued)

Dump Nests: It is very common to find more than 12 wood duck eggs in a nest, sometimes as many as 40 or more eggs. Large numbers of eggs result when more than one wood duck hen lays eggs in the same nest (Semel and Sherman 1992). This inter-specific nest parasitism is referred to as "dump nesting" and is common in wood duck populations.



Dump nests often result when nest sites are crowded together and are not visually isolated from each other. Wood duck hens see other hens enter cavities to lay eggs and also enter those cavities to lay their own eggs. Dump nesting is a natural part of wood duck nesting biology. Hens that dump eggs in other nests often lay and incubate their own clutches later in the season. Isolated nest boxes can also contain dump nests.

There are biological pros and cons to dump nesting, but it is generally considered favorable. With this behavior, the hen "doesn't put all her eggs (or genetic material) in one basket" and thus increases the odds that some of the eggs survive. Dump nests usually have a lower percentage of eggs that hatch as the hen cannot adequately incubate the large number of eggs. Usually, a greater total number of eggs hatch from dump nests than from non-dump nests.

Often, after a successful hatch, several eggs containing live embryos may remain behind. These remaining eggs are often eggs that were "dumped" into this nest after incubation began and would not have been incubated long enough to hatch.

2. BEGINNING A NEST BOX PROGRAM



ABOVE: A properly placed nest box

Nest box programs can increase or establish wood duck nesting in local areas where habitat is present but nest cavities are lacking. Good areas for wood duck nest box programs are areas where wood ducks are seen during spring and summer that also have heavily vegetated shorelines along ponds, marshes, or slow moving streams or rivers. Cover and food, for both the females and ducklings are the most important criteria. If feeding habitat is present, and wood ducks are present, availability of nest sites may be a factor limiting wood duck numbers.

A proper nest box program for wood ducks consists of:

1. Building or obtaining wood duck nest boxes and erecting them in suitable nesting habitat.
2. Checking the boxes during the season to monitor their use and keeping them available for wood ducks.
3. Cleaning, repairing, and monitoring the boxes on a regular basis.

Nest Box Construction

Exterior plywood (5/8") makes excellent wood duck boxes that will last more than a dozen years if properly built. Plywood boxes are less likely to split and break apart than boxes made out of boards. Do not make boxes out of particle board. Particle board boxes do not last long in the moist outdoors because the wood swells and screws and nails pull out.

Follow the nest box design in this booklet to build nest boxes that will be safe for wood ducks and will last for many years. Three nest boxes can be built from a 4' by 8' sheet of plywood by using the cutting guide in this booklet.

The dimensions of wood duck nest boxes are very important so that they do not become death traps for hen wood ducks. The elliptical entrance hole dimension (3 inches high by 4 inches wide) is critical for keeping most raccoons from entering nest boxes. The depth of the box below the entrance hole is critical because it keeps raccoons that are outside the box from reaching in and grabbing incubating hens off the nest.

The Procedure For Building Nest Boxes

1. Cut all the wood you are going to use to the proper dimensions (see cutting guide).
2. Plan to build the boxes with the rough sides of the wood on the inside of the boxes.
3. Drill five 1/4" holes in the bottoms (one in each corner and one center) to help the boxes drain if necessary.

Nest Box Construction Procedures (continued)

4. Make the entrance hole in the front boards of the boxes. Draw the outline of an oval that is 4 inches wide and 3 inches high on each front board so that the center of the elliptical is 4 inches down from the top of the board. A "starter hole" can be drilled within the drawn oval and the entrance hole can then be cut out with a jigsaw.
5. Cut and fold the 1/4" wire mesh ladders that will allow the ducklings to climb up the inside front of the box to their "exit hole". The wire mesh should be cut 8 inches by 18 inches. Fold a 1/2 inch edge of the mesh back onto itself along each side. This will keep the mesh from unraveling and eliminates protruding sharp ends. Firmly staple or tack the wire mesh with the folded or rough edges of the mesh against the inside of the front board of the box so that it reaches from the entrance/exit hole to near the bottom.

OPTION: Instead of a wire mesh ladder, the inside front of the box below the entry hole can be deeply scored with a router or wood chisel. This alternative to the wire mesh ladder will also allow ducklings to climb to the hole and exit the box.

6. Assemble the boxes by nailing or screwing through the sideboards into the edges of the front and backboards. Nails can be used to tack the boards together, but 2 inch wood screws should be used to hold the boxes together for many years. The backboard should extend about 4 inches above and 3 inches below the sideboards of the box.

Nest Box Construction Procedures (continued)

7. Screw the bottom boards inside the bottom of the box so as not to leave gaps that would leak nesting material.
8. Insert two 2 inch wood screws near the top and front of the side boards. Leave the heads of these screws sticking out about 1 inch from the wood. These exposed screws are to wrap a length of wire around that will secure the lid onto the top of the box. Side doors are not recommended as they weaken the structure of the box and opening a side door can panic the hens when checking boxes.
9. Place the lid on top and wire it on tightly with a piece of wire wrapped 2-3 times around each of the two protruding screw heads.
11. Tack or screw a 5/8" x 1 inch by 10 inches long strip of wood to the back board of the box just above the box lid. This will help hold the back of the lid of the box in place.
12. Drill three 3/8" holes in the top and bottom of the back boards so you have options for attaching the boxes vertically on trees that may not be growing straight.
13. Don't paint nest boxes because of possible paint toxins. Nest boxes should be numbered sequentially for record keeping purposes.

Nest Box Building Plans

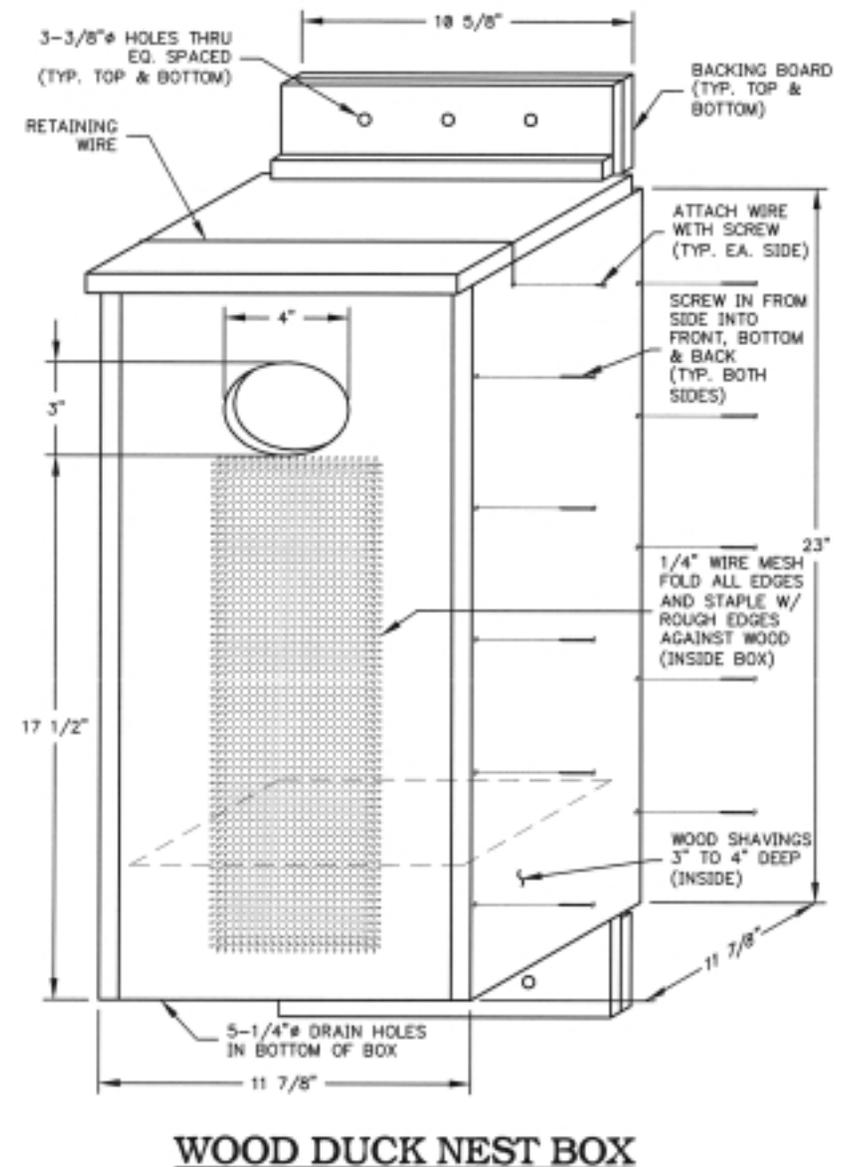


FIGURE 4: Nest box construction drawing

Nest Box Building Plans (continued)

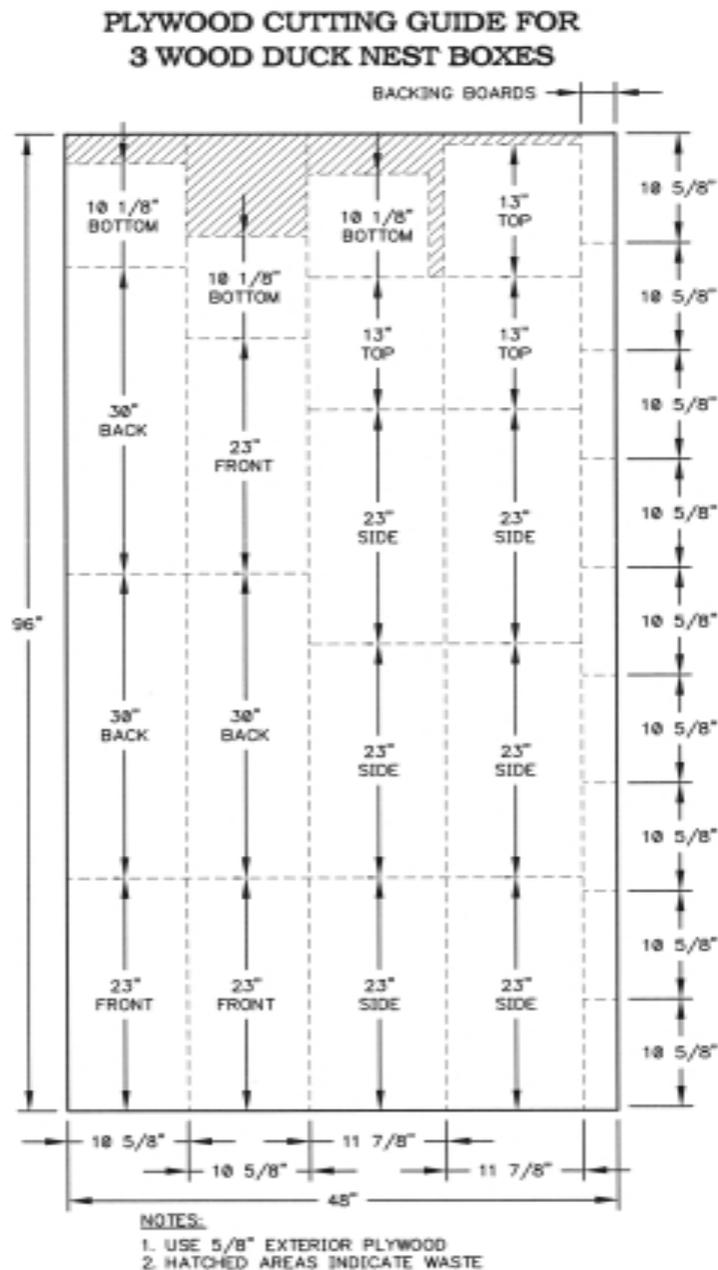


FIGURE 5: Template for cutting plywood sheet (makes three nest boxes).

Nest Box Placement

The best locations to place wood duck nest boxes are in wooded areas within 25 to 200 yards from small streams, ponds, coves, sloughs, and old river channels. Small bodies of water are preferred over large lakes and rivers. Wood ducks will nest a half-mile from water. However, the farther the nests are from water, the greater the danger the young ducklings face as they travel to the water. Boxes installed in densely wooded areas away from the shoreline are readily accepted by wood ducks and receive less predation and startling use than boxes in open areas along the shore.



Habitat near the nest boxes should include hiding cover for the ducklings. This cover might be emergent vegetation or branches and limbs of brush and trees hanging over or in the water. Logs, stumps, snags, and driftwood in the water near boxes add to the cover and provide loafing sites.

Tips For Placing Nest Boxes

1. Boxes facing toward water, so wood ducks can easily see them while swimming or flying, tend to receive higher use than boxes facing away from water.
2. Wood ducks show no apparent preference to the direction boxes face (north, east, south, or west).
3. Place boxes high enough to be above the highest floodwaters.
4. Boxes placed at heights so that the bottoms of the boxes are at least 6 to 12 feet above the ground are readily used by wood ducks and are seldom bothered by humans.
5. Do not place a box where it will be difficult or dangerous for a person to install, check, or maintain the box.
6. Place boxes so that there is a clear line of flight to and from the entrance hole, or clear limbs to allow a clear line of flight.
7. Fasten boxes to trees or posts with 3" to 5" long ¼" or 3/8" lag bolts or similar hanger bolts and large fender washers, rather than spikes or nails. These fasteners allow easier removal of the box if needed and can be loosened and adjusted as the tree grows.

Tips For Placing Nest Boxes (continued)

8. Use backing boards between the box and the tree to keep boxes from breaking apart in the future. Backing boards are scrap wood 3-4 inches wide and 8-10 inches long and vary from ½ to 2 inches thick with a hole drilled in it. Place the top and bottom lag bolts through the top and bottom attachment holes in the back of the box, through a backing board (which acts as a cushion), and into the tree.
9. Mount boxes vertical or with a slight forward lean. Boxes with a backward tilt may prevent ducklings from climbing and exiting the box and also tend to collect more rainwater.
10. Boxes should be mounted firmly. Boxes hanging loosely to a tree or post are often rejected and not used by female wood ducks.
11. Before leaving each box, make sure there is 4" of wood shaving type nesting material in the bottom and that the lid is wired on tight.
12. Place boxes so they are at least 30 feet apart from each other or visually isolated from each other. Nest boxes erected too close together invite dump nesting and predation.
13. Make a record of the location of each nest box (by box number) and the support or type of tree it is attached to. It may be helpful to mark the location of the nest boxes on a map.

Predator Guards

Raccoons, and sometimes mink, can be serious predators of wood duck hens when they are incubating eggs. Raccoons will also eat the eggs. Predator guards provide some measure of protection from raccoons and mink.

Site-specific conditions may determine what type of predator guard would be most useful.

1. The 3 inch by 4 inch elliptical nest box entry hole is a good guard against raccoons in Washington State. Early nest box designers found that raccoons one year old and older could not enter holes 3 inches by 4 inches in size, but the hole size is just large enough so that wood ducks can enter it.

2. Sometimes the original 3" by 4" hole on the box becomes worn, damaged, or enlarged so as to allow raccoons entrance into the box. To fix this, screw a face plate (a piece of wood 7" by 11" and 5/8" or thicker with a cleanly cut 3" by 4" hole) onto the front of the nest box to align with the original entrance hole. This will form a "right sized" hole and slightly longer entrance tunnel that should restrict raccoons.

3. Boxes placed in trees surrounded by or standing in water tend to receive less predation.

4. A 2-3 foot wide piece of thin sheet metal wrapped around the trunk of the nest box tree and fastened with sheet metal screws will keep raccoons and mink from climbing the tree to get at the box. It is important that the predators cannot reach the tree from above the predator guard by branches and limbs from other trees.

Predator Guards (continued)

5. For boxes mounted on posts or pipes, a 3-4 foot long piece of PVC pipe 4-6 inches in diameter hanging below the box and around the post or pipe will keep raccoons from climbing the pipe. The post can also be wrapped with a length of sheet metal.



ABOVE: Metal wrap predator guard fastened around tree (left). PVC pipe predator guard slipped over post (right).

6. Inverted metal cones attached below boxes mounted on pipes or posts have been effective. However, the metal cone does not usually last as long as the nest box, after which the box becomes unprotected.

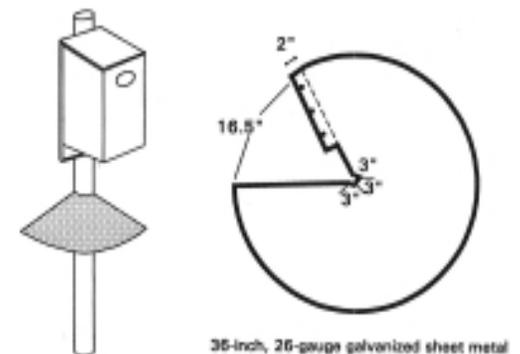


FIGURE 6: Inverted metal cone predator guard.

Nesting Material

Nesting material influences wood duck use of your boxes. Wood ducks do not carry nesting material into nest boxes, so managers must add it annually.

The best types of nesting material for nest boxes are wood shavings or small wood chips. Agricultural or Grange supply stores stock bales or bags of cedar or wood shavings under the name of "litter for livestock". This material is easily obtained and optimum in size. Wood ducks tend not to lay eggs in boxes with wood chips that are too large and coarse or too fine and powdery. Light colored nesting material reduces starling use of nest boxes.

Nesting material should be about 4" deep. If boxes contain more than 4" of wood shavings, the incubating hens sit too high within the box and are within reach of a raccoon from outside the entrance hole. If there is not enough nesting material in the box, the hen cannot cover her eggs as she lays them (one egg per day). Also, if there is not enough nesting material, the eggs do not receive enough insulation and protection during incubation.

Nesting material should be refreshed during the nesting season after a nest has been completed (hatched or destroyed). This sometimes allows a nest box to produce two nests during the same nesting season. Refresh nesting material prior to each new nesting season.

Remove old eggs, nests, feathers, grass, and whatever else might have accumulated in the box. Discard this far from the nest box so it does not attract predators. Nest box cleaning is generally done during the annual box maintenance. Fewer nests, eggs, and ducklings are produced in nest boxes that are not checked and maintained regularly (Utsey and Hepp, 1997).

3. MAINTAINING A NEST BOX PROGRAM

A nest box program is like a vehicle: periodic maintenance is needed to keep it running right. Once you've put in the expense and effort to erect nest boxes, you want to keep them in good working order. Maintained nest boxes produce more ducks.

Pre-Season Nest Box Check

Prepare nesting boxes for each new nesting season in late winter or very early spring, before wood ducks start nesting. Some wood ducks start laying eggs by March tenth in western Washington and by April first in eastern Washington.

1. Move nest boxes that have not been used for several years and repair or replace damaged boxes.
2. Clean out or refresh old nesting material and remove debris or bird droppings that have accumulated in the boxes.
3. Prune branches that obstruct the boxes.
4. Add predator guards to boxes where predation may be a problem.

Items suggested for pre-season nest box checks

- Sturdy 8-14 foot ladder
- Leather gloves
- Wood shaving nesting material
- Hammer and assorted nails
- Battery-operated screwdriver and screws
- Socket wrench, sockets, lag bolts, & washers
- Pruning shears for trimming branches
- Extra box lids and extra wire
- Field data notebook
- Camera and film (optional)

Mid-Season Nest Box Checks

After your boxes are ready for the nesting season, you should prepare to check them several times during the nesting season. Your nest boxes will produce more wood ducks (and less starlings) if you check them during the nesting season. The number of times you check boxes will depend on how many boxes you have and how much time you have to check them. Checking boxes at two-week intervals is optimum. But check your boxes at least twice during the nesting season.

Starlings are bad for wood ducks and other cavity nesting wildlife. Starlings are not native to the USA. They compete with many native bird species for nesting cavities and are considered a nuisance. Starlings are not protected by laws in this country, and they and their nests may be destroyed.

Checking nest boxes during the nesting season allows you to remove and destroy starling nests and eggs. This keeps the boxes available for wood duck use and reduces the number of starlings that may be imprinted to your nest boxes in future years. Wood ducks will seldom use a box that a starling has half filled with nesting material. Starlings are very aggressive and will harass wood ducks away from nest boxes the starlings are using.

Checking nest boxes during the nesting season allows you to:

1. Keep the boxes available for wood duck use
2. Remove starling nests
3. Monitor boxes being used by which species
4. Determine the number of eggs laid and hatching success
5. Identify predation problems, and
6. Keep a record of what happens in each box.

End-of-Season Or Final Nest Box Check

This is the last, or sometimes the only, time that the nest boxes may be checked. These checks provide information concerning if the box was used, what species used the box, and the fate of the nest. This check also identifies predation problems and identifies boxes that may need attention before next year. The season ending nest box check alone does not maximize wood duck use of your nest boxes and does not lessen the number of starlings your boxes may produce.

A nest box program should be a continuing effort year after year. Recording and reporting your data should be part of that program. These records should include the location of each box so that others could monitor the boxes when you cannot. Keep a record of the use in each nest box to monitor the success of your nest box program annually. Records also help identify boxes that are regularly successful or unsuccessful. The unsuccessful boxes can be modified or moved.

An example of a record keeping form for nest box programs is included in this booklet. Modify or add to the form to meet your specific needs. Keep a record of the use and success of your nest boxes. Report the results of your nest boxes to the local office of the Washington Department of Fish and Wildlife and or the U.S. Fish and Wildlife Service.

Safety

Check and maintain wood duck boxes with a partner. Working in remote wooded areas along streams climbing ladders or trees can have natural hazards. A partner will help make the project safer and more efficient and fun.

The Rights, Wrongs, and Why (continued)

7. **Place boxes so that their bottoms are 6-12 feet above ground or 3 feet above the expected highest water levels.**

Why: Wood ducks use nest boxes erected 6-12 feet high as much or more than they use boxes erected higher or lower. Boxes placed too close to the ground may attract more predators and human disturbance. Boxes too high are difficult or dangerous to check. Boxes should be high enough to prevent flooding during high waters.

8. **Put "backing boards" (about 3-4 inches wide and 8-10 inches long, varying from ½ to 2 inches thick) to act as buffers between the box and tree. Lag bolts can be inserted through box, then through backing board, and into tree.**

Why: As the tree bark grows (especially where the lag bolts attach the box to the tree) the growing bark will push against the backing boards. These backing boards will push evenly against the back of the box and keep the box from breaking apart for years.

9. **Place boxes vertical or tilted slightly forward. When needed, this can be done by using a thick backing board at the top hole and a thin backing board at the bottom hole.**

Why: Ducklings may not be able to climb up and out from boxes that are tilted back away from the opening.

The Rights, Wrongs, and Why (continued)

10. **Make sure boxes have about 4 inches of nesting material (either wood shavings or small wood chips) in the bottom.**

Why: Wood ducks do not carry nesting material into nest boxes. Hens bury their eggs under nesting material during the egg laying period. The nest material helps insulate, cushion, and protect the eggs during incubation.

11. **Inspect boxes regularly during the nesting season.**

Why: To remove debris brought in by other animals. To remove undesirable species, such as bees, wasps, or starlings. To make repairs that might be needed. To replace nest materials as needed. To collect information on nest box use and success. To clean out the nest box after early nest attempts for possible second nests. To keep the boxes available for wood duck nesting throughout the nesting season.

12. **Wear leather gloves when checking nest boxes.**

Why: Gloves will protect hands from slivers and cuts.

13. **Have extra wood shaving or wood chip nesting material with you when checking boxes.**

Why: Flickers and starlings will remove nest material from boxes. If boxes need to be cleaned out during the nest season, wood shavings may need to be replaced or added.

The Rights, Wrongs, and Why (continued)

14. **Make sure boxes have removable lids.**
Why: Removable lids make boxes easier to check without disturbing nesting hens. The box must be opened up for annual cleaning and replacing nesting material. Boxes with removable lids are stronger, sturdier boxes and will last longer than boxes with side opening access doors.
15. **Number your nest boxes.**
Why: To help keep track of box location, use, and success during record keeping.
16. Provide a **"ladder" on the inside front of the box between the bottom and the entrance hole (refer to nest box construction procedures).**
Why: The "ladder" will give the ducklings footing and make it easier for them to climb up to the entrance hole to leave the box the day after they hatch.
17. **Fold over a ½ inch seam along each edge of the wire mesh ladder to leave a smooth, uncut edge. Then staple the wire mesh (with the cut side of the wire mesh against the wood) to the inside front of the box.**
Why: The folded edges of the wire mesh ladder will keep the ladder from becoming frayed and developing loose, sharp projections that could poke hens or ducklings.
18. **Drill five ¼" holes in the bottom of the box before construction.**
Why: These holes will provide drainage for the box.

The Rights, Wrongs, and Why (continued)

19. **Pre-drill 3 attachment holes (left, center, and right) 2" from the top and bottom of the back board of the nest box.**
Why: Several pre-drilled holes will let you select the one that best allows vertical mounting of the nest box on tree trunks that are not vertical; (Example: the top right and bottom left holes might be used to attach a nest box to a tree leaning from left to right).
20. **When building boxes, nail and screw through the sides of the box and into cut edges of the front and backboards of the box.**
Why: The box will hold together longer as the box hangs and weathers over the years. Screws and nails through the sides of the box into the front and back boards will not pull out because they are perpendicular to the pull of gravity as the heavy box leans away from the tree.
21. **Use predator guards under boxes mounted on posts and, when possible, on trees.**
Why: Often, not always, predator guards can easily keep raccoons and mink from destroying hens and eggs in nest boxes.
22. **Place boxes in good wood duck habitat in locations where they can be easily and safely checked and maintained.**
Why: To make it easier for you or others to check, repair, and maintain the nest box after it is erected. Nest boxes that are dangerous, too high, or inconvenient to check are less likely to be monitored or maintained over the years. Safety should be a concern with all projects.

The Rights, Wrongs, and Why (continued)

23. **Use a sturdy stepladder or lightweight extension ladder to erect and check boxes.**

Why: A ladder allows nest boxes to be erected at proper heights for wood duck use and so that humans will not bother them. Ladders also make wood duck nest box work easy and safer.

24. **Make the nest box entrance hole a 3" by 4" elliptical hole as shown below.**

Why: Raccoons cannot enter a 3" by 4" elliptical hole to prey on incubating hens or eggs.

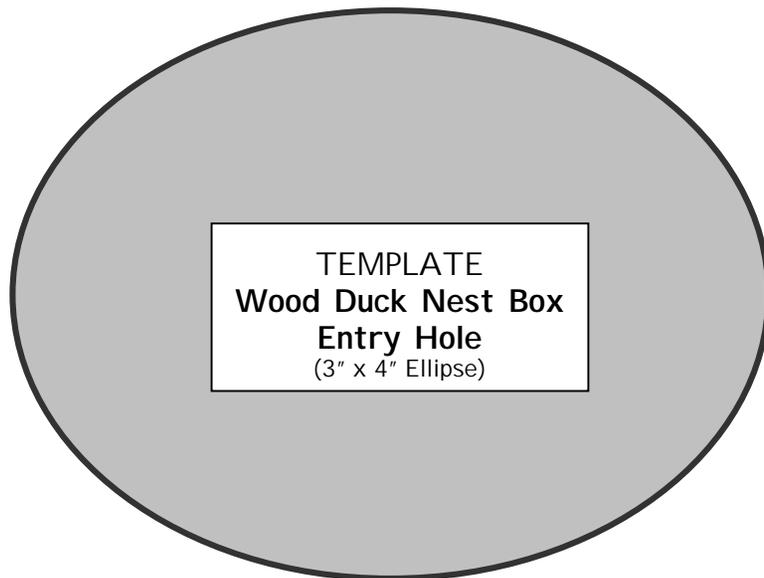


FIGURE 8: Template for proper size & and shape of a wood duck nest box entrance hole.

5. IDENTIFYING PREDATORS OF WOOD DUCK HENS AND EGGS IN WASHINGTON

Telltale Signs to Look For

RACCOON: The dead wood duck hen is often present in or near box. If the hen is found, the carcass is not decapitated. Much of the hen's carcass will usually be eaten. Feathers and blood are often present and scattered about in, on top of, or near the box. Signs that the hen struggled are evident. Muddy or bloody raccoon tracks may be on box lid. Long, silvery-gray raccoon hair may be snagged on rough edges of box or in the entrance hole. The wood duck eggs are usually broken and crushed and much of contents are eaten if the raccoon is small enough to get into the nest box.

MINK: The decapitated carcass of the hen will usually be in the nest box. Often, the hen's body will be in an incubating posture, and will seem undisturbed. Few feathers will be scattered about in or near the box. Much blood may be evident. Signs of a struggle may be lacking. Hen's carcass may be uneaten. The wood duck eggs will be unmolested.

LARGE HAWKS: The dead wood duck hen may be found outside nest box, often decapitated. Much of the wood duck hen's carcass may be eaten. The wood duck eggs will be whole and uneaten.

NORTHERN FLICKER: The wood duck hen will not be dead. There will be no signs of struggle, blood, or large feathers. The wood duck eggs will have tiny holes pecked in them. Some of the wood duck eggs may be missing. Flicker eggs may be present.

**6. OTHER WILDLIFE THAT MAY USE WOOD
DUCK NEST BOXES IN WASHINGTON**



ABOVE: Eggs of (from left to right) Hooded Merganser, Wood Duck, Western Screech Owl, American Kestrel, European Starling, and Northern Flicker (photo by Steve Simmons).

What You May Find in a Nest Box

HOODED MERGANSER: Will nest in wood duck boxes. Clutches are 5 to 12 white eggs, size 2-1/10" x 1-3/4". Wood ducks and hooded mergansers may sometimes both lay eggs in same nest in mixed clutches.

COMMON GOLDENEYE: May nest in wood duck boxes. Clutches are 6 to 15 pale green eggs, size 2-3/5" by 1-2/3". May form mixed clutches with wood ducks.

BUFFLEHEAD: May nest in wood duck boxes. Clutches are 6 to 14 olive green to creamy white eggs, size 2" by 1-1/2". May form mixed clutches with wood ducks.

What You May Find in a Nest Box (continued)

AMERICAN KESTREL: May nest in wood duck boxes. Clutches are usually 3 to 5, rust to light brown, heavily spotted eggs, size 1-2/5" by 1-1/8". Adults are often seen nearby.



ABOVE: Young American Kestrels (left) and young Western Screech Owls (right) in nest boxes. (photos by Steve Simmons)

WESTERN SCREECH OWL: May nest or roost in wood duck boxes. Clutches are 3 to 7 white eggs, size 1-1/2" by 1-1/3". Adults regurgitate "owl pellets" of hair, bone and feathers outside box.

NORTHERN SAW-WHET OWL: May nest or roost in wood duck boxes in NW Washington. Clutches are 3 to 7 chalky white eggs, size 1" by 9/10". Adults regurgitate "owl pellets" of hair, bone and feathers and insect shells outside box.

What You May Find in a Nest Box (continued)

EUROPEAN STARLING: Will nest in wood duck boxes. Clutches are 3 to 7 sky blue eggs, 1-1/8" long. Nests consist of a large amount of grass and small twigs that may fill half the nest box. Starlings may build nests on top of existing wood duck eggs and nests, causing the wood duck hen to abandon her eggs. (see page 40 for methods of preventing starling use)

TREE SWALLOW: Will nest in wood duck boxes late in the season. Clutches are 3-5 very small, white eggs. Nests are cup shaped, usually in the corner of the box and consist of feathers from other birds.

NORTHERN FLICKER: Will nest in wood duck boxes. Clutches are 5 to 8 pale pink to white eggs, 1-1/8" long. Flickers will often destroy and remove wood duck eggs from nest boxes prior to laying their own eggs.

SQUIRRELS: A variety of squirrels may roost and nest in wood duck boxes in Washington. Squirrel nests inside boxes are composed of finely shaved bark and grasses formed into dense nests with a small hole. Young squirrels may be in the nest.

RACCOON: Raccoons could be found inside nest boxes if the entrance hole is larger than 3" high by 4" wide.

MINK: Mink have been found inside nest boxes.

OPOSSUM: Opossum may use nest boxes as a winter roost and for nesting in spring. An opossum builds a nest of leaves which may fill the nest box.

Reducing Nest Box Use by Starlings

It can be difficult to reduce starling use of nest boxes. Male starlings claim nest sites in fall and roost in them throughout winter. Starlings remain committed to their nest sites, even after their nesting material and eggs have been removed. They will build nests within a day and continue to lay eggs. Their incubation period is 11 to 13 days and the young fledge in 21 days.

Boxes placed in dense tree stands, away from open areas, receive less starling use than boxes placed near open areas. Starlings prefer small diameter boxes and dark nesting material.

Starling use has been reduced in nest boxes by covering the entrance holes with pieces of wood after the wood duck nesting season. Starlings then find other nest sites and become territorial about those sites during winter while the nest boxes are covered. The nest box hole coverings must be removed (preferably) just prior to the next wood duck egg laying season. Starling eggs laid in any nest boxes should be removed and destroyed so that starlings do not become imprinted to nesting in nest boxes.



ABOVE: Nest box hole covered to prevent starling nesting during off-season.

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